

SECTION 17250 – BACKBONE SYSTEM CABLING

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. General:

1. Provide a complete Backbone Cabling system that supports voice, data and video as indicated in Project Documents.
2. Provide racks, rack mounted termination equipment, terminations, labeling and testing for the Backbone Cabling system as indicated in Project Documents.
3. Provide a complete Telecommunications Grounding and Bonding system as indicated in Project Documents.
4. Provide all necessary materials and labor for the Backbone Cabling System and the Telecommunications Grounding and Bonding System in all Telecommunication Entrance Facilities, Telecommunications Rooms and Telecommunications Equipment Rooms as indicated in Project Documents.

B. Backbone Cabling Subsystems:

1. Fiber Optic Backbone Cabling System
 - a. Provide a complete Fiber Optic Backbone Cabling system as indicated in Project Documents.
 - b. Provide Fiber Optic Backbone system cables, rack mounted fiber optic termination enclosures, terminations and testing for the Fiber Optic Backbone Cabling system as indicated in Project Documents.
2. Unshielded Twisted Pair (UTP) Backbone Cabling System
 - a. Provide a complete UTP Backbone Cabling system as indicated in Project Documents.
 - b. Provide UTP Backbone system cables, rack mounted termination equipment, terminations, labeling and testing for the UTP Backbone Cabling system as indicated in Project Documents.

3. Coaxial Backbone Cabling System

- a. Provide a complete Coaxial Backbone Cabling system as indicated in Project Documents.
- b. Provide Coaxial Backbone system cables, rack mounted termination equipment, terminations, labeling and testing for the Coaxial Backbone Cabling system as indicated in Project Documents.

C. Telecommunications Grounding and Bonding System

- 1. Provide a complete Telecommunications Grounding and Bonding system as indicated in Project Documents
- 2. Provide Telecommunications Main Grounding Busbar (TMGB), Telecommunications Grounding Busbars (TGB), Telecommunications Bonding Backbones (TBB), TBB Interconnecting Bonding Conductors (TBBIBC) and Bonding Conductor for Telecommunications as indicated in Project Documents.
- 3. It shall be the responsibility of this contractor to ensure that the telecommunication grounding system for this facility is continuous, complete, and meets or exceeds all applicable codes and standards.

1.2 SCOPE OF WORK

- A. Refer to Section 17100, paragraph 1.2 as well as Description of Work listed above.

1.3 RELATED DOCUMENTS

- A. Structured Cabling System General Provisions - Section 17200
- B. Horizontal System Cabling - Section 17260

1.4 QUALITY ASSURANCE

- A. Refer to Section 17200, paragraph 1.4.

1.5 SUBMITTALS

- A. Refer to Section 17200, paragraph 1.5.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Provide materials listed by UL or ETL.
- B. All cable must be NEC type OFNP or NEC type CMP unless otherwise noted.

2.2 INTRABUILDING FIBER OPTIC BACKBONE CABLE

A. Specifications:

- 1. Provide tight buffer or break out Inter-building Fiber Optic Backbone Cables constructed as indicated in Project Documents
- 2. NEC OFNR rated

a. Multimode fiber specifications:

- 1) Provide graded index multimode fiber.
- 2) Attenuation (typ.) 3.0 dB/km @ 850nm, 0.9 db/km @ 1300nm
- 3) Attenuation (max.) 3.7 dB/km @ 850nm, 1.9 dB/km @ 1300nm
- 4) Bandwidth (min.) 2200 MHz/km @ 850nm, 500 MHz/km @ 1300nm
- 5) Numeral aperture $0.200 \pm 0.015/-0.010$
- 6) Core diameter $50 \mu\text{m} \pm 2.0 \mu\text{m}$
- 7) Cladding diameter $125 \mu\text{m} \pm 1.0 \mu\text{m}$
- 8) Coating diameter $245 \mu\text{m} \pm 10 \mu\text{m}$

b. Single-mode fiber specifications:

- 1) Attenuation (max) 0.7 dB/km @ 1310nm, 0.7 db/km @ 1550nm
- 2) Dispersion (max)
 - a) 1285-1330nm < 3.2 ps/nm-km
 - b) 1550nm 18 ps/nm-km
- 3) Cut-off wavelength $1260 \pm 100.0 \mu\text{m}$
- 4) Core diameter $8.3 \mu\text{m}$
- 5) Cladding diameter $125.0 \pm 2.0 \mu\text{m}$
- 6) Coating diameter $245.0 \pm 10.0 \mu\text{m}$

- B. Manufacturers: Subject to compliance with requirements, provide products by the following

1. Avaya SYSTIMAX LazrSPEED 300

2.3 FIBER OPTIC CROSS CONNECT

- A. Specifications

1. High density enclosure with capacity up to 72 fibers.
2. 19” rack mount, 4U
3. Grommeted entrance holes
4. Sliding drawer configuration
5. Internal fiber managers
6. Front label holder
7. Modular construction
8. Snap in activation adapter plates
9. Duplex SC style termination
10. Color coded adapter strips

- B. Manufacturers: Subject to compliance with requirements, provide products by the following

1. Avaya SYSTIMAX LSTLS Series

2.4 FIBER OPTIC PATCH PANEL

- A. Specifications

1. 12 gauge aluminum alloy construction
2. 19 rack mount
3. Grommeted entrance holes
4. Internal fiber managers
5. Front label holder
6. Modular construction
7. Snap in activation adapter plates
8. Duplex SC style termination

- B. Manufacturers: Subject to compliance with requirements, provide products by the following

1. Avaya SYSTIMAX 600ALS Series

2.5 FIBER OPTIC CONNECTORS

A. Specifications

1. General

- a. Duplex SC type connector
- b. Keyed connector
- c. Ceramic ferrule
- d. Epoxy based

2. Multi-mode:

- a. Beige in color
- b. Maximum insertion loss of 0.30 dB at 850 or 1300 nm.

3. Single-mode:

- a. Blue in color
- b. Maximum insertion loss of 0.30 dB at 1310 or 1550 nm.

B. Manufacturers: Subject to compliance with requirements, provide products by the following

- 1. Avaya SYSTIMAX

2.6 FIBER OPTIC EQUIPMENT CORDS

A. Specifications

- 1. Fiber specifications as listed above
- 2. Duplex SC connectors, beige for multimode, blue for single mode
- 3. 1 meter in length

B. Manufacturers: Subject to compliance with requirements, provide products by the following

- 1. Avaya SYSTIMAX

2.7 UNSHIELDED TWISTED PAIR (UTP) BACKBONE CABLE

1. Specifications:

- a. Category 6 compliant
- b. Pair counts as indicated in Project Documents

c. Construction as indicated in Project Documents

2. Manufacturers: Subject to compliance with requirements, provide products by the following

a. Avaya SYSTIMAX

2.8 INTRABUILDING UTP BACKBONE CABLE

A. Specifications:

1. Category 6 compliant
2. NEC CMR rated
3. Pair counts as indicated in Project Documents
4. Construction as indicated in Project Documents

B. Manufacturers: Subject to compliance with requirements, provide products by the following

1. Avaya SYSTIMAX

2.9 UTP 110 CROSS CONNECT

A. Specifications:

1. 100 pair capacity
2. Side mounting legs
3. 110 termination
4. Designation Strips and Labels

B. Manufacturers: Subject to compliance with requirements, provide products by the following

1. Avaya SYSTIMAX

2.10 FIRESTOPPING

A. General

1. Provide Fire stopping Materials for Horizontal Cabling as indicated in Project Documents
2. Provide all labor and materials to maintain fire stopping at all penetrations at all times during construction
3. Provide all labor and materials necessary to insure adequate fire stopping

at all penetrations at completion.

4. Once all Backbone cables have been placed, all sleeves and other passageways for carrying the Backbone cable shall be plugged with an approved fire retardant plugging compound at each fire barrier penetration to meet local code requirements.

B. Specifications:

1. Provide pillow type intumescent fire stop material
2. ASTM E814(UL 1479) tested

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. A/D FIREBARRIER
2. Grace Construction Products FlameSafe
3. Specified Technologies, Inc. SpecSeal

PART 3 – EXECUTION

3.1 INSTALLATION

A. General

1. Install all racks and fiber cabling.
2. Maintain fire rating of all penetrations through rated walls during construction.
3. Coordinate fire stopping of all cable runs through floor sleeves with the general contractor.

B. Main Telecommunications Room:

1. General:
 - a. Install all cabling and secure in a high state of dress utilizing wire management brackets and Velcro Straps.
2. LAN racks:
 - a. Install racks in location as indicated on the Drawings.
 - b. Install fiber termination enclosures and patch panels.
 - c. Install vertical wire management rings.

C. Telecommunication Closets:

1. General:
 - a. Install all cabling and secure in a high state of dress utilizing wire management brackets and Velcro Straps.
2. LAN rack:
 - a. Install racks in locations as indicated on the Drawings.
 - b. Install vertical wire management rings.
- D. Backbone Cabling:
 1. Install cabling as per manufacturers recommendations.
 2. Do not exceed specified pulling tensions.
 3. Do not exceed specified bend radius.
 4. Provide a 3 meter maintenance loop of fiber cable in the cable tray prior to dropping onto the LAN rack.
 5. Use only Velcro Straps to secure and dress fiber cables.
- E. Fiber Optic Termination Enclosures:
 1. Install all cabling and secure in a high state of dress utilizing wire management system.
 2. Secure fiber jacket in a minimum of two locations.
 3. Install minimum one meter of unjacketed fiber strands coiled on the enclosure routing guides.
 4. Terminate and connect all fibers in fiber termination enclosure:
 - a. Populate the single-mode fibers on the ports beginning with 1.
 - b. Populate the multi-mode fibers on the next available port after the single-mode fibers.
 5. Use only Velcro type tie wraps to secure and dress fiber cables.
- F. Standard Racks:
 1. Install racks in locations as indicated on the Drawings.
 2. Install racks as per manufacturer's recommendations.
 3. Bolt relay racks to floor using expansion bolts.
- G. Grounding:

1. Ground all equipment as per manufacturer's recommendations, NEC and TIA/EIA guidelines.
2. Provide equipment grounding conductor from equipment grounding lugs to ground bar.
3. Provide a #6 AWG green insulated grounding conductor from LAN rack to ground bar.
4. Provide a #6 AWG green insulated grounding conductor from each end of the metallic sheath on the telephone backbone cable to the ground bar.

3.2 LABELING

A. General:

1. Provide labeling based on ANSI/TIA/EIA-606 administration concepts
2. Provide typewritten labels, hand labeling is not acceptable
3. Administration database shall utilize identifiers on labels

B. Telecommunication Spaces and Pathways:

1. Use the identifier EF for the Telecommunications Entrance Facility
2. Use the identifier MC for the Main Cross-Connect
3. Provide an identifier for each Intermediate Telecommunications Room that indicates the floor and an ordinal designation (e.g. 2TRW is the second floor telecommunications room on the West side of the building)
4. Provide an identifier for each Relay Rack in each Telecommunications Space that incorporates the Telecommunications Space identifier (e.g. 2TRW-RR3 is the third relay rack in the second floor telecommunications room on the west side of the building).
5. Provide an identifier for each Telecommunications Backboard in each Telecommunications Space that incorporates the Telecommunications Space identifier (e.g. 2TRW-TBB3 is the third backboard in the second floor telecommunications room on the west side of the building).
6. Provide an identifier for each Telecommunications Pathway

C. Telecommunication Space Terminating Hardware:

1. Provide an identifier for each Fiber Optic Patch Panel that incorporates the Relay Rack identifier (e.g. 2TRW-RR3-PP1 is the first patch panel in the third relay rack in the second floor telecommunications room on the west side of the building.)
2. Provide an identifier for each Fiber Optic Patch Panel port that incorporates the Patch Panel identifier (e.g. 2TRW-RR3-PP1-09 is the ninth port on the first patch panel in the third relay rack in the second floor telecommunications room on the west side of the building)

3. Provide an identifier for each Connecting Block that incorporates the Telecommunications Backboard identifier (e.g. 2TRW-TBB3-CB1 is the first connecting block on the third backboard in the second floor telecommunications room on the west side of the building)
4. Provide an identifier for each Connecting Block port that incorporates the Connecting Block identifier (e.g. 2TRW-TBB3-CB1-09 is the ninth port on the first patch panel in the third relay rack in the second floor telecommunications room on the west side of the building)

D. Grounding and Bonding System

1. Use TMGB for the Telecommunications Main Grounding Busbar
2. Provide an identifier for each Telecommunications Grounding Busbar that incorporates the identifier of the Telecommunications Space the busbar serves.
3. Label both ends of all grounding conductors with both bus bars connected.

E. Backbone Cable:

1. Provide both of the cable's Patch Panel Port identifiers on both ends of all backbone cables.
2. Insure that label is intact after termination of cable.

3.3 CABLE MANAGEMENT DATABASE

A. General:

1. Furnish a computerized cable management database
2. Furnish a Windows 95/98/NT compatible cable management database program, including installation, configuration, population and training
3. Furnish all licenses and transfer all rights to the database software
4. Database shall use the identifiers developed in "3.2 Labeling"

B. Record Information:

1. Record cable system information for input into the database.
2. Verify exact information to be recorded with the Architect.

C. Update Database:

1. Input record information into database.
2. Coordinate with Owner.

D. Manufacturers

1. IMAP/Textron “Doc-it”
2. Approved Equal

3.4 TESTING

A. General:

1. Certify system is complete and functional.
2. Test all cabling and connections. Perform final functional tests in presence of the Architect
3. Complete certified testing report.

B. Fiber Cable Testing:

1. After installation and termination, OTDR test all fibers:
 - a. Test all fibers in one direction from the main telecommunication room fiber termination enclosure.
 - b. Test building fibers:
 - 1) Multi-mode fibers at both 850 and 1300 nm.
 - 2) Single mode fibers at both 1310 and 1550 nm.
 - c. Test building backbone multi-mode fibers at 850 nm.
2. OTDR testing:
 - a. Test fibers using a launch cable between OTDR and ST connectors on the termination enclosure.
 - 1) Length as recommended by the OTDR manufacturer.
 - 2) Minimum length of 200 meters.
 - 3) Use identical length launch cable for all tests.
 - b. Test fibers using a tail cable connected to the ST adapter at the telecommunication closet termination enclosure.
 - 1) Length as recommended by the OTDR manufacturer.
 - 2) Minimum length of 100 meters.
 - c. OTDR settings:
 - 1) Set A line equal to launch cable length.

- 2) Adjust B line to a point at the end of the ST connectors at the telecommunication closet termination enclosure.
 - 3) Measure and record the attenuation of the fiber, two ST connectors at the management panel and two ST connectors at the telecommunication closet termination enclosure.
 - d. Provide hard copy trace of each test:
 - 1) Indicate date of test.
 - 2) Indicate the name of the tester.
 - 3) Indicate fiber identification number matching the cable.
 - e. Provide hard copy of each event table:
 - 1) Indicate the link loss.
 - 2) Indicate the return loss per link.
 - 3) Indicate date of test.
 - 4) Indicate the name of the tester.
 - 5) Indicate fiber identification number matching the cable label and including the fiber number identifier.
3. If any tested fiber fails:
 - a. Re-terminate both ends of fiber and re-test.
 - b. If re-test fails, replace cable and connectors at no additional cost to the Owner/User.

END OF SECTION 17250